

FEB 23 1962

Harrison-Walker Refractories Company



FINANCIAL HIGHLIGHTS *for 10 years*

| FOR THE YEAR | NET INCOME PER SHARE | | DIVIDENDS PER SHARE | | TOTAL DIVIDENDS | |
|-----------------|----------------------|------------------|---------------------|------------------|--------------------|------------------|
| | <i>Common*</i> | <i>Preferred</i> | <i>Common*</i> | <i>Preferred</i> | <i>In Cash</i> | <i>In Shares</i> |
| 1961 | \$2.19 | \$235.11 | \$1.80 | \$6.00 | \$5,816,329 | — |
| 1960 | 3.24 | 344.24 | 1.76 | 6.00 | 5,711,337 | \$4,041,668 |
| 1959 | 2.85 | 304.41 | 1.73 | 6.00 | 5,614,840 | — |
| 1958 | 2.73 | 291.04 | 1.72 | 6.00 | 5,585,589 | — |
| 1957 | 4.21 | 445.73 | 1.62 | 6.00 | 5,272,286 | — |
| 1956 | 3.47 | 368.23 | 1.33 | 6.00 | 4,352,993 | — |
| 1955 | 2.40 | 257.30 | 1.08 | 6.00 | 3,573,527 | 1,526,287 |
| 1954 | 1.37 | 149.49 | .92 | 6.00 | 3,063,238 | 1,040,364 |
| 1953 | 1.88 | 203.06 | .88 | 6.00 | 2,954,231 | 1,136,510 |
| 1952 | 2.06 | 221.62 | .85 | 6.00 | 2,850,743 | — |

| FOR THE YEAR | PRODUCTS SOLD | NET INCOME | INCOME RETAINED | DEPRECIATION AND DEPLETION | AMORTIZATION | FIXED ASSETS ADDED |
|-----------------|----------------------|---------------------|--------------------|-------------------------------|--------------|-----------------------|
| 1961 | \$ 84,399,545 | \$ 7,053,268 | \$1,236,939 | \$4,930,769 | — | \$ 3,515,430 |
| 1960 | 97,243,384 | 10,327,092 | 4,615,755 | 4,932,102 | — | 7,489,051 |
| 1959 | 87,909,687 | 9,132,447 | 3,517,607 | 4,723,066 | — | 8,279,593 |
| 1958 | 79,161,939 | 8,731,091 | 3,145,502 | 4,424,870 | — | 5,902,024 |
| 1957 | 104,008,702 | 13,372,030 | 8,099,744 | 4,006,192 | \$1,369,070 | 13,349,943 |
| 1956 | 94,672,360 | 11,047,111 | 6,694,118 | 3,377,757 | 3,891,109 | 11,753,280 |
| 1955 | 80,521,372 | 7,719,060 | 4,145,533 | 3,189,097 | 4,604,302 | 4,474,934 |
| 1954 | 57,480,489 | 4,484,670 | 1,421,432 | 2,946,807 | 4,630,480 | 8,818,663 |
| 1953 | 78,870,462 | 6,091,713 | 3,137,482 | 3,539,283 | 4,473,271 | 3,252,783 |
| 1952 | 77,040,218 | 6,648,636 | 3,797,893 | 3,485,330 | 3,062,743 | 12,662,867 |

| AT YEAR END | COMMON SHARES OUTSTANDING | SHAREHOLDERS' EQUITY PER COMMON SHARE* | MINORITY INTEREST IN SUBSIDIARIES | NOTES PAYABLE AFTER 1 YEAR | NET FIXED ASSETS | WORKING FUNDS |
|----------------|---------------------------------|--|---|----------------------------------|---------------------|---------------------|
| 1961 | 3,136,195 | \$27.43 | \$5,379,471 | \$14,400,000 | \$63,765,985 | \$41,012,154 |
| 1960 | 3,121,394 | 26.88 | 4,233,249 | 13,600,000 | 63,712,242 | 37,236,517 |
| 1959 | 3,023,382 | 25.34 | 3,958,858 | 14,800,000 | 61,453,913 | 35,891,834 |
| 1958 | 3,010,891 | 24.11 | 3,775,423 | 6,000,000 | 58,029,848 | 27,424,790 |
| 1957 | 2,999,222 | 23.00 | 3,078,823 | 7,200,000 | 56,590,170 | 26,373,415 |
| 1956 | 1,494,568 | 20.37 | 2,891,441 | 7,200,000 | 48,647,899 | 27,220,569 |
| 1955 | 1,481,512 | 18.11 | 2,835,742 | 7,200,000 | 42,994,916 | 24,936,665 |
| 1954 | 1,424,619 | 16.65 | 2,580,830 | 10,400,000 | 46,279,062 | 20,519,138 |
| 1953 | 1,374,040 | 16.11 | 2,587,423 | 11,100,000 | 45,388,820 | 20,288,223 |
| 1952 | 1,335,880 | 15.11 | 2,502,005 | 15,550,000 | 50,202,754 | 17,026,066 |

*outstanding at December 31, 1961

Harbison-Walker Refractories Company

CHAIRMAN'S LETTER *to the shareholders:*

INTRODUCTION

The 59th Annual Report of Harbison-Walker Refractories Company and subsidiaries is presented for the year ended December 31, 1961. Comparative financial statements on pages 4 to 7 are highlighted for 10 years on the opposite page. The report of certified public accountants is on page 8.

SALES

Slow recovery from the general economic dip influenced customers to postpone replacement and new construction of refractories in furnaces. Products shipped during 1961 of \$84,399,545 were 13.2% below 1960. Orders however increased gradually during the first 3 quarters, significantly in the last.

The reduced shipments to most customers were not offset by substantial gains in shipments to chemical producers and to iron and steel producers for blast furnaces and for basic oxygen furnaces.

INCOME

Net income was affected accordingly. The \$7,053,268 earned in 1961 after providing \$4,930,769 depreciation and depletion equaled \$2.19 per Common share outstanding December 31, 1961, compared with \$3.24 in 1960.

Pension costs were \$1,225,774 for 1961 services and \$202,555 for interest on unfunded past services, actuarially estimated December 31, 1961 at \$6,100,000. Consolidated Current and Retained Income for 1961 is detailed on page 5.

DIVIDENDS

An increase of \$104,992 over 1960, or \$5,816,329, was paid to shareholders in cash dividends in 1961. The increase was due mainly to new Common shares issued July 1, 1960 to shareholders as a 3% Common dividend. Preferred shareholders received \$180,000 paid the 20th day of January, April, July and October at the quarterly rate of \$1.50 per share. Common shareholders received \$5,636,329 paid at 45¢ per share the first day of March, June, September and December.

The Board of Directors declared January 25, 1962 the regular quarterly cash dividend of \$1.50 per Preferred share payable April 19, 1962 to holders of record April 6, 1962. The Board further declared a cash dividend of 45¢ per Common share payable March 1, 1962 to holders of record February 9, 1962.

FINANCIAL POSITION

Net working funds of \$41,012,154 at December 31, 1961, equal to \$13.08 per Common share outstanding, exceeded 1960 by \$3,775,637. The increase resulted in part from issuing \$12,000,000 notes payable \$400,000 semiannually from February 1, 1967, net of \$10,000,000 notes due October 9, 1964 repaid in full. Current assets were 4.1 times current liabilities, up from 3.8 at December 31, 1960. Shareholders' equity rose \$2,875,907 to a record \$94,410,668 equal to \$27.43 per Common share at year end.

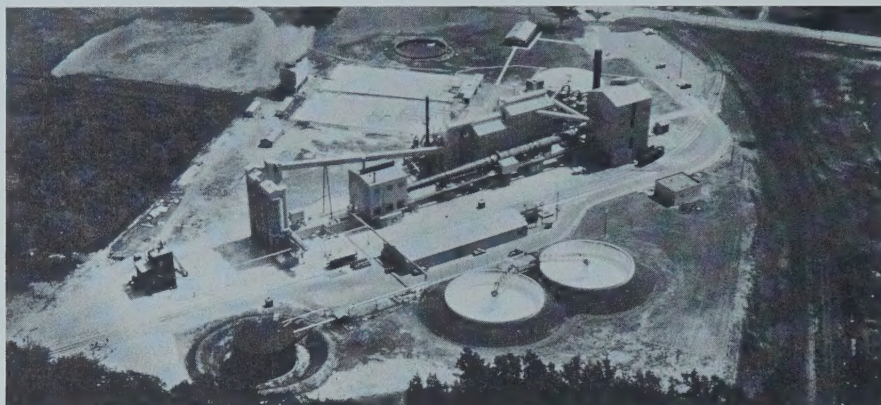
Public law 87-321 enacted September 26, 1961 first decided the basis of depletion allowed refractory clay and quartzite miners for 1951 through 1960. In federal income tax returns the Company calculated depletion on sales prices of crushed and ground products. The 1961 law affirms the same treatment processes at $\frac{7}{8}$ of the price. To end lengthy negotiations without protracted and expensive litigation, tax returns for the 10 years were amended per elections available by the 1961 law, and resulting taxes and interest thereon were paid January 18, 1962. Taxes provided through 1961 are considered adequate.

Clayburn-Harbison Limited which operates refractories plants at Abbotsford and Kilgord, British Columbia, became a consolidated subsidiary September 1

through purchase of additional equity. A substantial minority interest in the foremost Venezuelan fireclay refractories and ceramics producer Ceramica Carabobo, C. A. was acquired May 31.

FIXED ASSETS ADDED

Of the \$3,515,430 additions and normal replacement of fixed assets during 1961, the completion of the Ludington, Michigan basic materials plant, pictured below, accounted for the largest expenditure. The high-density, 98% pure magnesia



refractory processed here from underground brine is a major breakthrough in refractory linings, as highlighted below.

A rotary kiln was completed at Eufaula, Alabama to calcine refractory grade bauxite before shipment to the Bessemer, Alabama plant for manufacture into high-alumina refractories. Additional bauxite deposits in southern Alabama were prospected and purchased during 1961.

To meet customers' demand for basic refractories, additions to the basic specialties and stock buildings were built at the Hammond, Indiana plant. A tunnel-kiln burner system was replaced at the Baltimore, Maryland basic refractories plant; and forming machinery at the Clearfield, Pennsylvania fireclay refractories plants was improved to lower production costs. A warehousing service for marine and industrial customers along the East coast was added April 1.

A new fireclay refractories plant was built at Santiago to provide refractories for Chile. Separate grinding facilities for basic products were installed at the Lima, Peru plant to satisfy increased demand. Per an agreement signed in 1961, the Company will become the major owner in a new basic refractories plant to be built in Australia. Beginning in 1962 substantial fixed assets will be purchased for the new plant.

PRODUCT RESEARCH AND DEVELOPMENT

Linings of OXILINE tar-bonded basic refractories continued during 1961 to set service records in basic oxygen steel-making furnaces. Tonnage records of steel produced per refractory lining in 1960 by the oxygen process became commonplace in 1961 as operations were adjusted to take full advantage of the new, proven refractories. A recent record was 35% above the previous one.

The development and use in refractories of 98% pure magnesia with high density heretofore unattainable permit customers to operate furnaces at temperatures near 4,000° Fahrenheit. The Ludington magnesia is the basic material in the new product HARKLASE. Its unique purity and density appeal to open-hearth furnace operators, while its exceptional resistance to alkaline attacks promises increased use in regenerators of glass-tank furnaces, illustrated on page 10.

Heat-conserving LOW IRON INSULATING FIREBRICK refractories found growing acceptance for use in vacuum and controlled atmospheric furnaces. The complete product line extending to 3,300° Fahrenheit is now offered since the Windham, Ohio plant began their manufacture in 1961. New concepts on resist-

ance to penetration and reaction in copper metallurgy were applied to monolithic refractories resulting in their successful entry into the induction furnace market.

During its first year, the extra-dense aluminum oxide refractory KORUNDAL XD established sizeable markets by proving itself superior for side walls of ceramic tunnel kilns and bottoms of steel slab heaters.

EMPLOYEE RELATIONS

Wages were increased comparable with the steel industry an average of 8¢ per hour and the cost-of-living premium was adjusted 1½¢ per hour October 1, 1961, raising wage costs almost 5%. The only labor contract negotiated in 1961 was a 2-year contract signed at the Ione, California plant; almost all others terminate during the third quarter of 1962. Severity of accident injuries continued to decline from 1960, as 4 works completed the year without a single disabling injury.

Over 80% of eligible salaried employees, executives excluded, are enrolled in a payroll savings plan to acquire equity. The plan purchased 37,736 Common shares in the open market since inception May 1, 1957, and will distribute 6,102 shares to 642 participants in the 1959 class yet this month.

EXECUTIVE CHANGES

P. C. Mitchell and J. C. Willey were elected Directors by shareholders at their annual meeting April 27, 1961. Mr. Mitchell, a Vice President since April 24, 1953, held various mine engineering positions since September 1922. Mr. Willey, since July 7, 1955 Director-Gerente of Refractarios Peruanos S. A., a consolidated Peruvian subsidiary, held various production and administrative positions with the Company since October 1, 1934.

The resignation of former President Raymond Willey, a Director since 1917, was accepted with regret April 27, 1961. Mr. Willey was employed in February 1902 and served as President from May 25, 1939 until he retired July 7, 1948. The death of the eldest Director Otto M. Reif was recorded May 5, 1961 with sorrow. First employed in 1899 to head the engineering staff, he was elected Director in 1903 and Vice President in 1908. Mr. Reif retired in 1931 but continued as a Director.

G. F. Cronmiller, Jr. retired April 27, 1961 as Vice President and Secretary. Employed March 1, 1913, he held many financial positions before elected Secretary in 1947 and Vice President in 1950.

Thomas Welfer was elected Secretary April 27, 1961. Employed since 1942, he was appointed Assistant General Counsel in 1953.

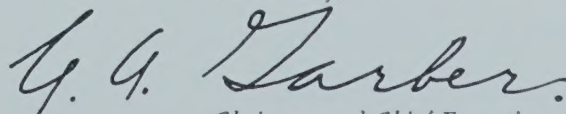
OUTLOOK

Demand for exceptional quality refractories increases as customers improve furnace processes. Newly researched and developed products are daily proving their merit by fulfilling demands while also lengthening service lives. Shipments and orders increased significantly in recent months. With the expected high-level production by customers in the coming several months, sales could approach record levels.

Increased labor costs continue to squeeze margins even with cost-saving programs. Charges for depreciation and depletion should slightly exceed 1961. Capital expenditures and investments in 1962 should each exceed 1961.

A notice of the April 26, 1962 annual meeting of shareholders at the principal office in Pittsburgh, together with a proxy statement and form, will be mailed to each shareholder about March 21, 1962.

Yours truly,



Chairman and Chief Executive

Pittsburgh, Pennsylvania
February 6, 1962

consolidated **SOURCE AND USE** *of working funds*

| SOURCE: | <i>Year ended December 31,</i> | 1961 | 1960 |
|---|--------------------------------|----------------------------|---------------------|
| Operations: | | | |
| Net income for the year | | \$ 7,053,268 | \$10,327,092 |
| Non-cash costs of depreciation and depletion provided | | 4,930,769 | 4,932,102 |
| | | 11,984,037 | 15,259,194 |
| Minority shareholders' interest in subsidiaries: | | | |
| Net income undistributed | | 95,084 | 262,391 |
| Capital shares purchased | | 70,941 | 12,000 |
| Net working funds acquired with subsidiary | | 639,472 | — |
| Notes payable issued | | 12,000,000 | — |
| Common shares sold | | 492,746 | 220,207 |
| Net cost of fixed assets retired | | 29,843 | 298,620 |
| | | <u>25,312,123</u> | <u>16,052,412</u> |
| USE: | | | |
| Fixed assets added and replaced | | 3,515,430 | 7,489,051 |
| Investments purchased | | 954,727 | 307,341 |
| Notes payable liquidated | | 11,200,000 | 1,200,000 |
| Minority interest in debt liquidated by subsidiary | | 50,000 | — |
| Cash dividends declared | | 5,816,329 | 5,711,337 |
| | | <u>21,536,486</u> | <u>14,707,729</u> |
| WORKING FUNDS: | | | |
| Net increase during the year | | 3,775,637 | 1,344,683 |
| At beginning of year | | 37,236,517 | 35,891,834 |
| At close of year | | <u>\$41,012,154</u> | <u>\$37,236,517</u> |

consolidated **CURRENT AND RETAINED INCOME**

| REVENUES: | <i>Year ended December 31,</i> | 1961 | 1960 |
|--|--------------------------------|----------------------------|---------------------|
| Products sold | | \$84,399,545 | \$97,243,384 |
| Dividends, interest and other income | | 878,961 | 629,696 |
| | | <u>85,278,506</u> | <u>97,873,080</u> |
| COSTS: | | | |
| Employment: | | | |
| Wages and salaries | | 27,196,929 | 30,311,678 |
| Social security taxes | | 1,177,723 | 1,280,014 |
| Pensions (page 1), insurance and other fringes | | 3,010,159 | 3,050,402 |
| | | <u>31,384,811</u> | <u>34,642,094</u> |
| Materials, supplies and services purchased | | 33,222,108 | 37,486,136 |
| Depreciation and depletion | | 4,930,769 | 4,932,102 |
| Interest | | 685,077 | 733,098 |
| Minority shareholders' interest in subsidiaries' income | | 295,336 | 262,391 |
| Taxes, other than payroll and income taxes | | 1,148,772 | 1,219,295 |
| Federal, foreign and state income taxes (page 1) | | 6,558,365 | 8,270,872 |
| | | <u>78,225,238</u> | <u>87,545,988</u> |
| NET INCOME FOR THE YEAR | | <u>7,053,268</u> | <u>10,327,092</u> |
| DIVIDENDS DECLARED: | | | |
| In cash: | | | |
| Preferred at \$6.00 per share | | 180,000 | 180,000 |
| Common at \$1.80 per share | | 5,636,329 | 5,531,337 |
| In 90,824 common shares, or 3% of common shares issued, at market value of \$44.50 per share | | — | 4,041,668 |
| | | <u>5,816,329</u> | <u>9,753,005</u> |
| CONSOLIDATED INCOME RETAINED IN THE BUSINESS: | | | |
| During the year | | 1,236,939 | 574,087 |
| At beginning of year | | 53,763,760 | 53,189,673 |
| At close of year (note 1) | | <u>\$55,000,699</u> | <u>\$53,763,760</u> |

(See accompanying notes)

CONSOLIDATED

| NET ASSETS.....at December 31, | 1961 | 1960 |
|--|-----------------------------|-----------------------------|
| WORKING FUNDS: | | |
| Current assets: | | |
| Cash | \$ 11,342,744 | \$ 6,146,643 |
| Government and other marketable securities at cost, quoted December 31, 1961 at \$1,417,223 | 356,119 | 5,480,361 |
| Accounts receivable | 11,398,822 | 8,036,108 |
| Inventories, at costs below market: | | |
| Refractory brick finished and in process, at last-in, first-out cost | 8,528,838 | 9,280,162 |
| Other products, raw materials and supplies, at average cost | 21,885,866 | 21,061,594 |
| Prepaid expenses | 619,753 | 487,157 |
| Total current assets | <u>54,132,142</u> | <u>50,492,025</u> |
| Current liabilities: | | |
| Federal income taxes (page 1) | 5,183,556 | 4,968,813 |
| Other taxes | 1,326,109 | 1,812,206 |
| Accounts payable and other liabilities | 5,410,323 | 5,274,489 |
| Notes payable within 1 year at 3¼% | 1,200,000 | 1,200,000 |
| Total current liabilities | <u>13,119,988</u> | <u>13,255,508</u> |
| Net working funds | <u>41,012,154</u> | <u>37,236,517</u> |
| INVESTMENTS, at cost below underlying equity | <u>4,032,529</u> | <u>4,186,002</u> |
| FIXED ASSETS: | | |
| Buildings, machinery and equipment, at cost | 134,086,181 | 127,909,208 |
| Less accumulated depreciation | <u>79,534,379</u> | <u>73,079,613</u> |
| Net buildings, machinery and equipment | 54,551,802 | 54,829,595 |
| Mineral lands, rights and development, at cost less depletion | 7,342,688 | 7,142,560 |
| Land, at cost | 1,871,495 | 1,740,087 |
| Net fixed assets | <u>63,765,985</u> | <u>63,712,242</u> |
| Total working funds, investments and fixed assets | <u>108,810,668</u> | <u>105,134,761</u> |
| NOTES PAYABLE after 1 year: | | |
| \$600,000 semiannually to August 1, 1964 at 3¼% | 2,400,000 | 3,600,000 |
| \$400,000 semiannually from February 1, 1967 at 4⅞% | 12,000,000 | — |
| Other at 5¼% prepaid October 10, 1961 | — | 10,000,000 |
| | <u>14,400,000</u> | <u>13,600,000</u> |
| Net assets, in which shareholders' equity is invested | <u>\$ 94,410,668</u> | <u>\$ 91,534,761</u> |

(See acc

ANCIAL POSITION

| SHAREHOLDERS' EQUITY.....at December 31, | | 1961 | 1960 |
|--|-------------------|----------------------------|----------------------------|
| MINORITY SHAREHOLDERS' interest in subsidiaries | | <u>\$ 5,379,471</u> | <u>\$ 4,233,249</u> |
| PREFERRED SHARES, 6% cumulative, non-callable, \$100 par value; authorized and issued—30,000 shares | | <u>3,000,000</u> | <u>3,000,000</u> |
| COMMON SHARES, \$7.50 par value; authorized 4,000,000 shares (note 2): | | | |
| 1961—3,136,195 shares | 23,521,463 | — | |
| 1960—3,121,394 shares | — | 23,410,455 | |
| CAPITAL IN EXCESS OF PAR VALUE; the increase represents excess of proceeds over par value of common shares sold (note 2) | 7,509,035 | 7,127,297 | |
| INCOME RETAINED IN THE BUSINESS (note 1) | 55,000,699 | 53,763,760 | |
| Common shareholders' equity | 86,031,197 | 84,301,512 | |
| Harbison-Walker Refractories Company shareholders' equity | <u>89,031,197</u> | <u>87,301,512</u> | |
| Total shareholders' equity | | <u><u>\$94,410,668</u></u> | <u><u>\$91,534,761</u></u> |

ing notes)

NOTES to financial statements

1. Income retained in the business

In the note agreements the Company agreed neither to declare cash dividends except from consolidated income after December 31, 1960 plus \$12,000,000 nor to let funded debt due after 1 year exceed net working funds. Of \$55,000,699 consolidated income retained in the business at December 31, 1961, \$41,763,760 was restricted.

2. Restricted stock option plan

A restricted stock option plan adopted July 26, 1956 by shareholders permits the Company to grant

officers and key employees non-assignable options to purchase, generally in the last 8 of 10 years after date of grant, 205,199 unissued or reacquired Common shares at prices not under 95% of market at date of grant. During the year, options on 14,801 shares were exercised at \$28.19 and \$35.91 per share. At December 31, 1961, options were outstanding for 15,884 shares granted August 3, 1956 at \$28.19 per share, 35,983 shares granted August 29, 1958 at \$35.91 per share and 618 shares granted January 12, 1960 at \$47.85 per share. At December 31, 1961, 108,253 shares were available for future options under the plan.

ACCOUNTANTS' REPORT

ARTHUR YOUNG & COMPANY
CERTIFIED PUBLIC ACCOUNTANTS

U.S.A., CANADA, MEXICO, SOUTH AMERICA
GREAT BRITAIN, CONTINENTAL EUROPE
MIDDLE EAST, SOUTH AFRICA, AUSTRALIA

430 SEVENTH AVENUE
PITTSBURGH 19

The Shareholders and Directors of Harbison-Walker Refractories Company

We have examined the accompanying consolidated statement of financial position of Harbison-Walker Refractories Company and subsidiaries at December 31, 1961 and the related consolidated statements of current and retained income and of source and use of working funds for the year then ended. Our examination was made in accordance with generally accepted auditing

standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the statements mentioned above present fairly the consolidated financial position of Harbison-Walker Refractories Company and subsidiaries at December 31, 1961 and the consolidated results of their operations for the year then ended, in conformity with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Arthur Young + Company

February 6, 1962

PRODUCTS

"Refractories are defined as 'nonmetallic materials suitable for the construction or lining of furnaces operated at high temperatures.' Stability at high temperatures — both physical and chemical — is the primary requirement for refractory products. They may be called upon, while hot, to withstand pressures from the weight of furnace parts or contents, thermal shock resulting from rapid heating or cooling, other stresses induced by temperature change, mechanical wear resulting from movement of furnace contents, and chemical attack by heated solids, liquids, gases, or fumes.

"Refractories are indispensable for substantially everything that is manufactured. Their need is obvious for the smelting of ores, refining of metals, generation of steam power, and the production of glass, portland cement, pottery, and building brick. Directly and indirectly, though less obviously, refractories are equally important in many other industries. They provide a vital need in the production of paper, lumber, textiles, plastics, and nearly all other manufactured materials.

"Refractory products of various kinds are needed for the many and widely diversified industrial applications. Those in greatest tonnage demand are classified on the basis of composition or properties into a few main types, known as fireclay, high-alumina, silica, basic, and insulating refractories, in each of which there are different classes. In addition, there are various special refractories, including silicon carbide, graphite, carbon, zircon, zirconia, fused-cast products, and several others."

*Quoted from the 4th edition of
MODERN REFRACTORY PRACTICE
referred to on page 12.*

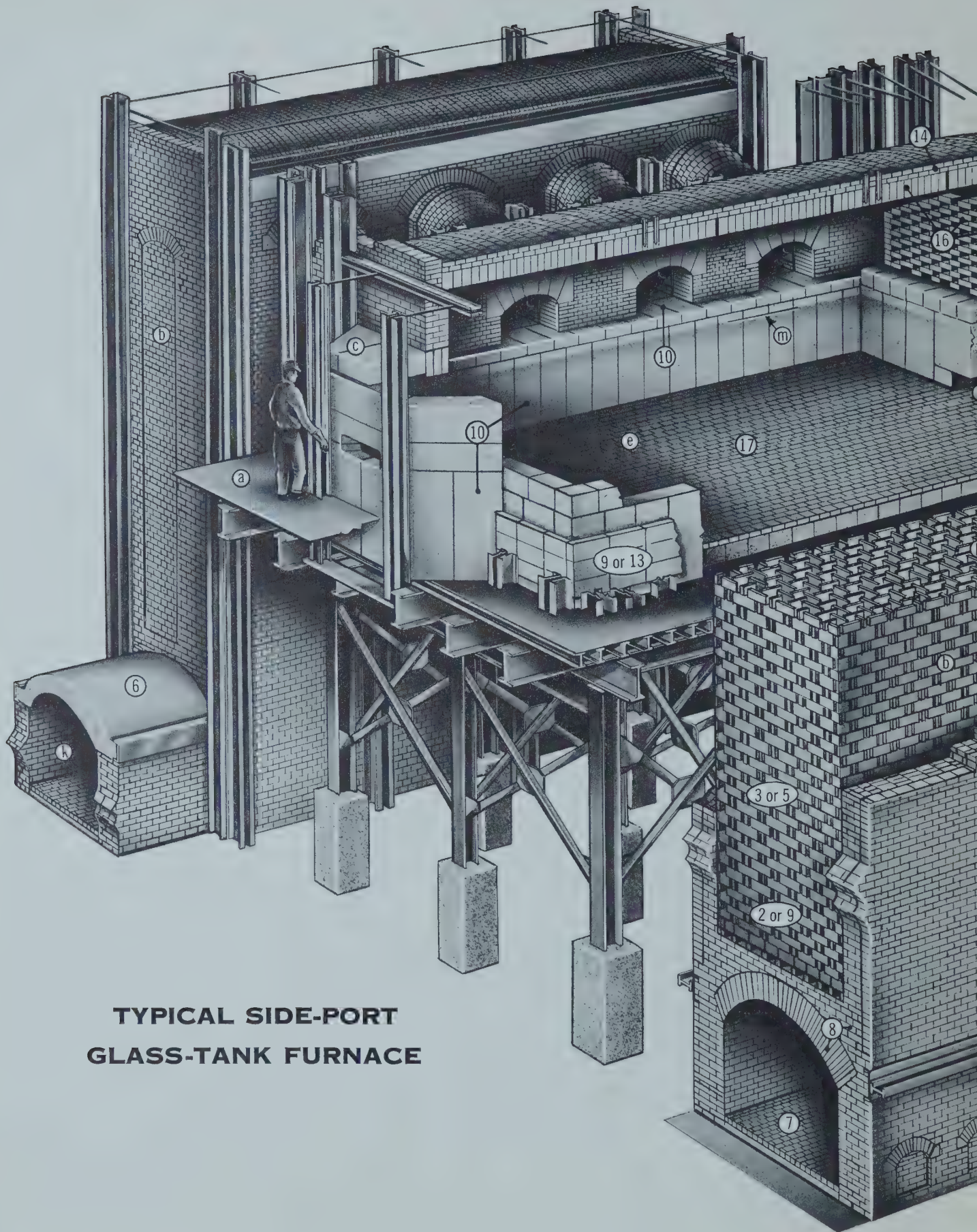
In the main, refractory products are supplied as pre-formed brick or shapes but also important in the product line are refractories in the bulk or packaged form such as high temperature bonding mortars, hydraulic setting castables, plastic and ramming mixes, gunning mixes, and granular products.

The photograph at the right shows a refractory gunning mix being applied to resurface a furnace wall.

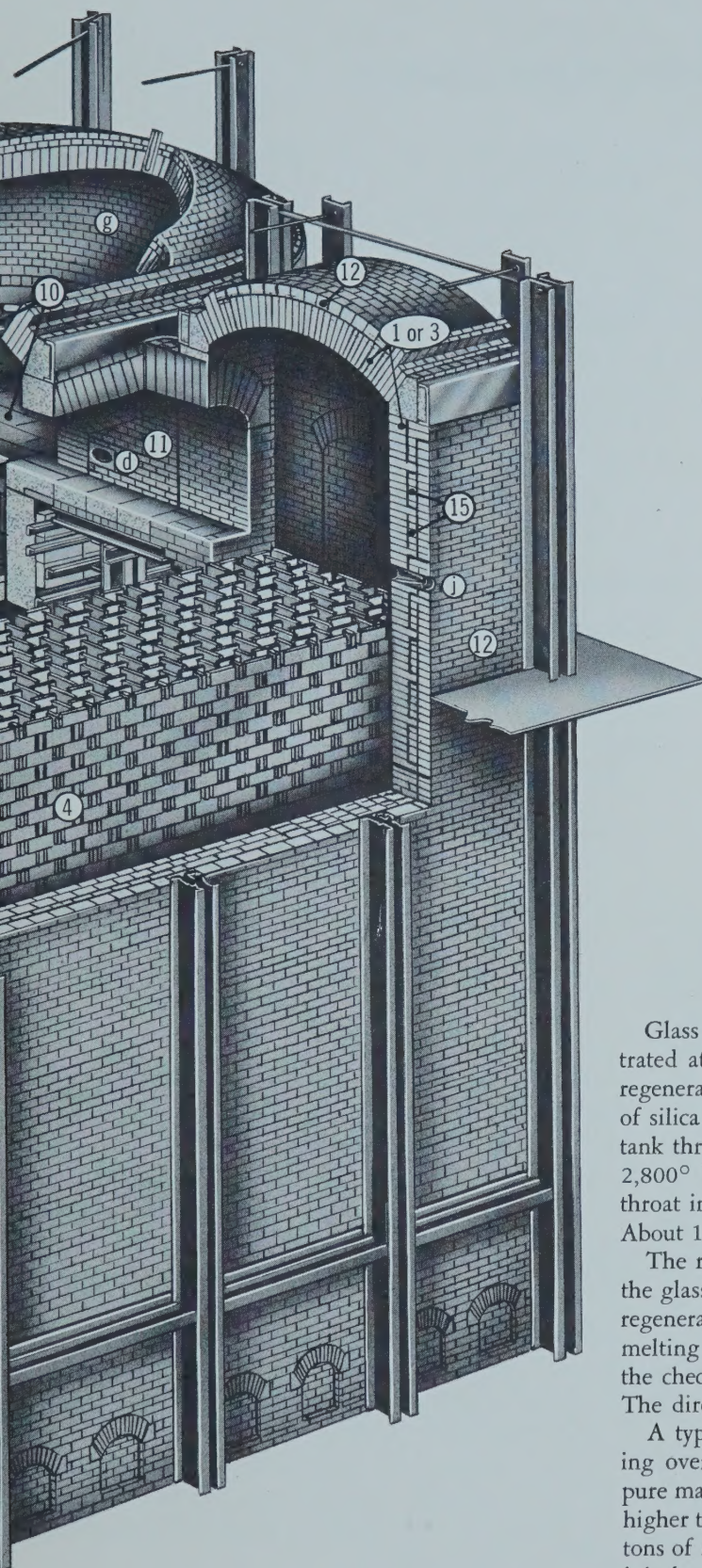
Placement may be accomplished at the rate of several tons per hour per gun with substantial savings in labor to customer and, in certain applications, the resulting job will last longer. The Company has researched and developed many gunning mixes with due regard to refractory composition, to quality control, to adaptability to specific guns, and to the varied operating conditions prevailing in various furnaces.



Gunning mixes selected for specific properties are used in a variety of applications ranging from initial linings in catalytic crackers and heaters in the petrochemical industries through the repair and maintenance of open-hearth steel furnaces, blast furnaces, glass-tank regenerators and copper smelting furnaces, to mention but a few. Technical employees well-versed in the field advise and consult customers on selection of the proper products and techniques of installation for each specific application. Their services are very much in demand.



**TYPICAL SIDE-PORT
GLASS-TANK FURNACE**



Harbison-Walker

REFRACTORIES:

Basic brick:

- 1 CHROMEX B
- 2 CHROMEX S
- 3 FORSTERITE L
- 4 HARKLASE
- 5 THERMAG H
- 6 H-W EXTRA STRENGTH CASTABLE

Fireclay brick:

- 7 H-W high duty
- 8 H-W super-duty
- 9 VARNON D
- 10 Fused-cast MONOFRAX®
- 11 H-W MULLITE high-alumina brick

Insulating brick:

- 12 H-W 23 or H-W 26
- 13 LOTHERM
- 14 VEGALITE
- 15 KAOSIL semi-silica brick
- 16 STAR or VEGA silica brick
- 17 H-W ZIRCON brick

OTHER FURNACE PARTS:

- | | |
|-------------------|--------------------|
| a Charging floor | g Refining chamber |
| b Regenerator | h Checker brick |
| c Dog house | i Peep hole |
| d Burner | k Flue to stack |
| e Melting chamber | m Metal line |
| f Throat | |

Glass for containers is produced in tanks or furnaces similar to the one illustrated at left. Essentially a 3-story refractory structure, the furnace consists of 2 regenerator chambers connected to a central glass tank by ports. Raw materials of silica sand, soda, lime, cullet and various other ingredients are charged into the tank through the opening in the dog house and melted at a temperature of about 2,800° Fahrenheit in the melting chamber. The liquid glass passes through the throat into the refining chamber from where it is conveyed to forming machines. About 100 tons of glass are produced in the continuous operation every 24 hours.

The regenerators preheat air which is combined with fuel and ignited to melt the glass batch. Air is heated as it passes up through hot checker firebricks in one regenerator and is mixed with fuel as it passes the port burners on entering the melting chamber. The products of combustion leave via opposite ports and heat the checker firebricks in the other regenerator as they pass to the flue and stack. The direction of air flow is reversed to heat fresh air as it passes hot checkers.

A typical glass-tank furnace contains about 1,000 tons of refractories, including over 100 tons of checkers in the regenerators. The newly developed 98% pure magnesia refractories, such as HARKLASE, resist increased alkali fluxes and higher temperatures that attack checkers. A typical furnace also includes about 175 tons of fused-cast refractories produced by Harbison-Carborundum Corporation, a jointly-owned manufacturer. The fused-cast refractories, named MONOFRAX®, are widely used as they are highly resistant to erosion by liquid glass.

uses for **HARBISON-WALKER** *refractories*

Iron & Steel

Air furnaces
Annealing furnaces
Basic oxygen furnaces
Coke ovens
Cupolas
Electric furnaces
Forge furnaces
Galvanizing and
tin plating furnaces
Iron blast furnaces
and stoves
Ladles
Malleable iron furnaces
Metal mixers
Open-hearth furnaces
Pouring pits
Reheating furnaces
Soaking pits

Cement, Glass, Ceramics

Cement kilns
Ceramic kilns
Dolomite kilns
Enameling furnaces
Frit furnaces
Glass-tank furnaces
illustrated on page 10
Lime kilns
Magnesite kilns

Non-Ferrous Metals

Aluminum melting furnaces
Brass and bronze melting
furnaces
Carbon baking furnaces
Copper converters
Copper reverberatory and
refining furnaces

Lead smelting and
refining furnaces
Magnesium and sodium
furnaces and cells
Multiple-hearth roasters
Nickel smelting and
refining furnaces
Petroleum coke calciners
Precious metal furnaces
Tin furnaces
Titanium and zirconium
chloride furnaces
Zinc furnaces

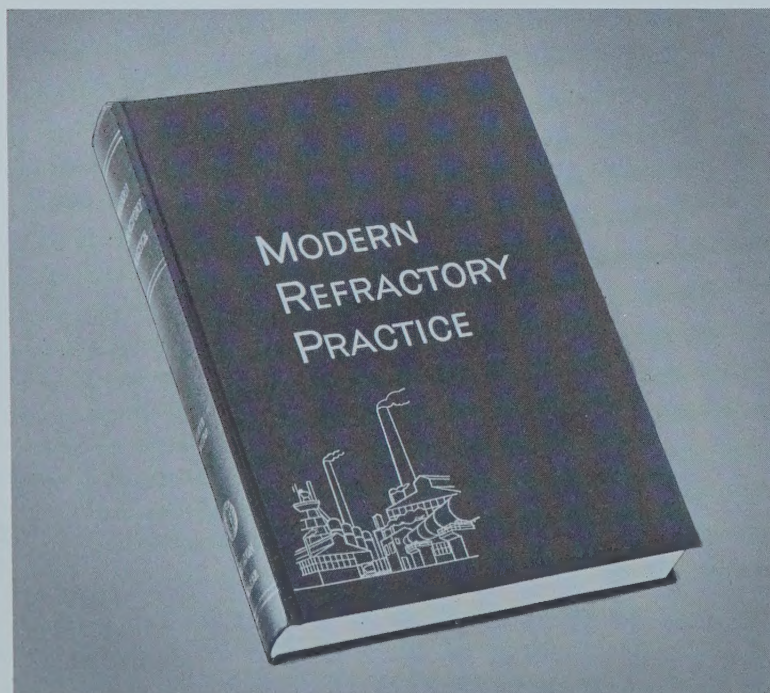
Chemicals & Petroleum

Acid and chemical
constructions
Butadiene reactors
Digesters
Oil-gas sets

Oil refining and
processing furnaces
Paper industry smelters
Petrochemical equipment
Phosphorus and
phosphate furnaces
Silicate of soda furnaces
Sulphur burners

Power & Fuels

Carbon black furnaces
Domestic heating furnaces
Gas producers
Gas reformers
Incinerators
Industrial stacks
Industrial heating furnaces
Missile launching pads
Steam power furnaces



MODERN REFRACTORY PRACTICE

Illustrated at left is the 4th edition of MODERN REFRACTORY PRACTICE published by the Company in 1961. Following the general plan of the 3rd edition in 1950, the new MRP was completely rewritten and increased in size from 440 to 608 pages. It combines a catalog of Harbison-Walker products, a practical engineering handbook and a comprehensive technical treatise on refractories. It explains the various properties and qualities of refractories and suggests practical selection and use of refractories—data useful to those interested in the design, construction and operation of industrial furnaces. Detailed drawings illustrate modern refractory practice in 32 types of furnaces. MRP is used by purchasing agents, engineers, plant operators and research staffs of customers and as a textbook by various engineering schools and universities.

Harbison-Walker Refractories Company

307 FIFTH AVENUE, PITTSBURGH 22, PENNSYLVANIA

DIRECTORS

| | |
|--------------------|-----------------------|
| F. H. Atwood | E. A. Garber |
| W. Forman Bickel | E. T. Hile |
| A. B. Bowden | Robert L. Kirkpatrick |
| C. A. Brashares | P. C. Mitchell |
| H. B. Campbell | Norman P. Pitt |
| Richard G. Croft | J. C. Willey |
| Ralph S. Euler | A. Brent Wilson |
| John D. Fredericks | H. H. Yeager |

OFFICERS

| | |
|---------------------------|------------------------------|
| E. A. Garber . . . | Chairman and Chief Executive |
| A. Brent Wilson | President |
| E. T. Hile | Vice President |
| P. C. Mitchell | Vice President |
| C. A. Brashares | Vice President |
| Lawrence E. Mock . . | Vice President and Treasurer |
| Thomas Welfer | Secretary |

GENERAL COUNSEL

F. H. Atwood, Pittsburgh 22, Pennsylvania

CERTIFIED PUBLIC ACCOUNTANTS

Arthur Young & Company, Pittsburgh 19, Pennsylvania

TRANSFER AGENTS

Pittsburgh National Bank, Pittsburgh 30, Pennsylvania
Morgan Guaranty Trust Company of New York, New York 15, New York

REGISTRARS

Bankers Trust Company, New York 15, New York
Mellon National Bank and Trust Company, Pittsburgh 30, Pennsylvania



HOW

Locations

- ★ SALES OFFICES
- ▲ WAREHOUSES
- PLANTS
- MINERALS

COVER STORY *The map is reproduced from the new 4th edition of MODERN REFRACTORY PRACTICE, discussed on page 12. Locations of 24 sales offices, 22 warehouses, 32 plants and numerous mineral deposits of the Company and its consolidated North American subsidiaries illustrate one way Harbison-Walker Refractories Company service is the most complete. To reflect this leadership, the new, bold, modern trademark shown above was adopted.*